MODIS Normalized Water-Leaving Radiance (MOD 18) and Aerosol Optical Depth (MOD 37)

Product Description

This Level 2 and Level 3 product contains ocean water-leaving radiances for 7 of the 36 wavelengths/ spectral bands (Bands 8 through 14, 412 through 681 nm) of MODIS. These are the "ocean" bands; the water-leaving radiances in these bands are used to derive nearly all of the MODIS ocean products. In addition, another key parameter generated by the algorithm is provided as product MOD 37: Aerosol Optical Depth. The Level 2 product is provided daily at 1-km resolution for cloud-free pixels, while the Level 3 product is provided daily, 8-day weekly, monthly, and yearly. The product constraints are that only cloud-free pixels are used (with Sun glitter below a threshold), and all valid pixels are outside a distance threshold from land. The product availability is at-launch.

Research and Applications

Normalized Water-Leaving Radiance is the radiance that would exit the ocean in the absence of the atmosphere, if the Sun were at the zenith. It is used in the bio-optical algorithms to estimate chlorophyll *a* concentration and ocean primary productivity on a global scale. The algorithm evolved from experience from the CZCS experiment, which proved the feasibility of measuring ocean color from space. Extensive testing of the algorithm is being conducted using SeaWiFS imagery and will be continued using the Terra and Aqua MODIS instruments. This is the fundamental product for recovering most of the MODIS ocean products.

Data Set Evolution

Inputs to the algorithm are the Level 1 radiances in Bands 8-14, screened for clouds and land, and estimates of the surface wind speed, atmospheric pressure, and ozone concentration derived from National Centers for Environmental Prediction (NCEP, formerly the NMC) products. The success of the algorithm depends on the accurate characterization of the atmospheric effect, which for water typically constitutes 90 percent of the at-satellite radiance. The algorithm includes single scattering, multiple scattering effects, and whitecap removal, and uses six types

of ancillary data. There are three major sources of uncertainty in the product: 1) The candidate aerosol models chosen to describe the aerosol may be unrepresentative of the natural aerosol, 2) there is uncertainty in the estimate of the whitecap reflectance/radiance, and 3) there is uncertainty in the sensor's radiometric calibration. Efforts to reduce these uncertainties include development of improved aerosol models, direct measurements of the properties of oceanic whitecaps, and utilization of the Marine Optical Buoy (MOBY) calibration site to improve radiometric calibration. The product will be validated by comparing simultaneous surface-based measurements (including drifting-buoy radiometers) and MODIS-derived values at a set of locations.

Suggested Reading

Chomko, R., and H.R. Gordon, 1998.

Deschamps, P.Y. *et al.*, 1983.

Evans, R.H., and H.R. Gordon, 1994.

Gordon, H.R., 1997.

Gordon, H.R., and D.K. Clark, 1981.

Gordon, H.R., and A.Y. Morel, 1983.

Gordon, H.R., and M. Wang, 1994.

Gordon, H.R. *et al.*, 1997.

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MODIS Normalized Water-Leaving Radiance and Aerosol Optical Depth Product Summary

Coverage: Global ocean surface, clear-sky only

Spatial/Temporal Characteristics: 1 km/daily (Level 2), 4.6 km, 36 km, 1°/daily, 8-day, monthly, yearly (Level 3)

Key Science Applications: Ocean chlorophyll, ocean productivity

Key Geophysical Parameters: Water-leaving radiances in the ocean bands, aerosol optical depth

Processing Level: 2, 3

Product Type: Standard, at-launch

Maximum File Size: 88 MB (Level 2); 640 MB binned, 134 MB mapped (Level 3)

File Frequency: 144/day (Daily Level 2); 7/day (Daily Level 3), 7/8-day (8-day Level 3), 7/month (Monthly Level 3), 7/year (Yearly Level 3)

Primary Data Format: HDF-EOS

Additional Product Information: http://modis-ocean.gsfc.nasa.gov/dataprod.html

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